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PATENT ABSTRACTS OF JAPAN

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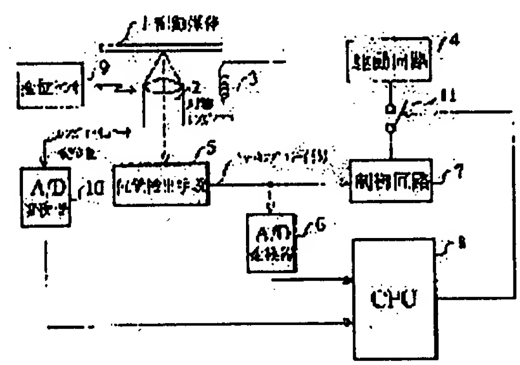
(72)Inventor : MURAO HIROSHI

(54) OPTICAL INFORMATION PROCESSING DEVICE

(57)Abstract:
PURPOSE: To access at high speed by detecting timing in which tracking servo pull-in can be performed and turning on a tracking servo.
CONSTITUTION: Timing in which tracking servo pull-in can be stably performed by a displacement sensor 9 is detected based on relation between a displacement amount of a lens actuator detected by a displacement sensor 9 and a tracking error signal detected by a position detecting means 5. When the timing is detected, a switch 11 is turned on, an output signal of a control circuit 7 is supplied to a driving circuit 4 which drives the lens actuator, and tracking servo pull-in is forcedly performed.



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CLAIMS

[Claim(s)]
[Claim 1] In the optical information processor which drives a lens actuator based on the tracking error signal acquired from the reflected light of the light beam condensed on the record medium, and performs the tracking of an objective lens An amount detection means of displacement to detect the amount of displacement after said lens actuator drive, A rate detection means to detect the rate of said lens actuator from said tracking error signal, The optical information processor characterized by having the tracking servo level-luffing-motion means which draws a tracking servo in a stable condition based on the amount of displacement and rate of said lens actuator.
[Claim 2] It is the optical information processor characterized by being the displacement sensor to which the amount detection means of displacement detects the amount of displacement of the direction of tracking of a lens actuator in claim 1.
[Claim 3] The optical information processor characterized by to have an amplitude detection means detect the amplitude after said lens actuator drive, a rate detection means detect the rate of said lens actuator from said tracking error signal, and the tracking servo level-luffing-motion means that draw a tracking servo based on the amplitude of said lens actuator, and the rate of said lens actuator in the optical information processor which drives a lens actuator based on the tracking error signal acquired from the reflected light of the light beam condensed on the record medium, and performs the tracking of an objective lens.
[Claim 4] It is the optical information processor characterized by detecting the amplitude of a lens actuator by an amplitude detection means' carrying out the monitor of the tracking error signal in claim 3, and counting the number of trucks in the time amount of the one half of the period of vibration of a lens actuator.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the optical information processor which carries out record playback of the information on a record medium with an optical means.
[0002]
[Description of the Prior Art] As shown in drawing 8 (a), while tracking is performed so that the beam spot may trace between the truck guides 1a and 1b of two and the beam spot is tracing the center of a truck, a tracking error signal serves as zero and an optical information processor usually sets up this location as a tracking servo target position, as shown in drawing 8 (b).
[0003] However, when the access distance to the target truck to trace is long, this tracking servo is made off and a head is moved to that target position. Drawing 9 expresses this condition, and as shown in drawing 9 (b), it sets a tracking servo to OFF, and as shown in drawing 9 (c), it moves a lens actuator to a target truck by driving a predetermined time head.
[0004] As shown in drawing 9 (a) during this migration, a tracking error signal occurs. If a drive is stopped to predetermined timing, a lens actuator will arrive at a target truck soon, but as shown in drawing 9 (a) immediately after that, vibration of the tracking error signal by residual vibration remains. And since a tracking error signal stops vibrating when it goes through the lens actuator setting latency time, it waits for it, a tracking servo is set to ON, and the servo of the beam spot is carried out in the center of a truck.
[0005]
[Problem(s) to be Solved by the Invention] However, since the latency time until the residual vibration of a lens actuator sets was required for such conventional equipment, there was a technical problem were limited in improvement in the speed of access.
[0006] It detects that this invention was not made in view of such a situation, and became the timing which can perform tracking servo level luffing motion even if residual vibration does not set, a tracking servo is set to ON, and improvement in the speed of access is attained.
[0007]
[Means for Solving the Problem] In order to solve such a technical problem, the optical information processor according to claim 1 by this invention In the optical information processor which drives a lens actuator based on the tracking error signal acquired from the reflected light of the light beam condensed on the record medium, and performs the tracking of an objective lens An amount detection means of displacement to detect the amount of displacement after a lens actuator drive (step 106), A rate detection means to detect the rate of a lens actuator from a tracking error signal (step 105), It is characterized by having the tracking servo level-luffing-motion means (step 108) which draws a tracking servo in a stable condition based on the amount of displacement and rate of a lens actuator.
[0008] An optical information processor according to claim 2 is characterized by the amount detection means of displacement being a displacement sensor (9) which detects the amount of displacement of the direction of tracking of a lens actuator in the equipment of claim 1.

[0009] In the optical information processor which an optical information processor according to claim 3 drives a lens actuator based on the tracking error signal acquired from the light beam reflected light condensed on the record medium, and performs the tracking of an objective lens An amplitude detection means to detect the amplitude after a lens actuator drive (step 152), A rate detection means to detect the rate of said lens actuator from a tracking error signal (step 156), It is characterized by having the tracking servo level-luffing-motion means (step 160) which draws a tracking servo based on the amplitude of a lens actuator, and the rate of a lens actuator.
[0010] In the equipment of claim 3, an amplitude detection means carries out the monitor of the tracking error signal, and an optical information processor according to claim 4 is characterized by detecting the amplitude of a lens actuator by counting the number of trucks in the time amount of the one half of the period of vibration of a lens actuator.
[0011]
[Function] the lens actuator detected by the displacement sensor 9 -- a variation rate -- if the timing which can be drawn in stability by CPU9 at a tracking servo is detected from the relation between an amount and the tracking error signal detected by the location detection means 5 and the timing is detected, tracking servo drawing in will be performed compulsorily.
[0012]
[Example] In case tracking servo level luffing motion is performed, relation between the variation rate of the residual vibration of a lens actuator and a rate as shown in drawing 10 is. That is, even if vibration has not set completely, the field which can perform tracking servo drawing in is in stability. This invention detects the field which can carry out tracking servo drawing in to stability paying attention to that.
[0013] There are two kinds of approaches in this detection, and the 1st approach is the case where the amount of displacement of a lens actuator is measurable, and performs control from that amount of displacement and rate in that case. The 2nd approach detects the amplitude by carrying out the monitor of the time amount of the one half of the lens actuator period of vibration, and the tracking error signal, and controls by measuring the time amount from which a tracking error signal changes by detecting a rate.
[0014] First, the case where the amount of displacement of a lens actuator is measurable is explained. Drawing 1 is the block diagram showing the configuration at this time, the beam is irradiated by the record medium 1 with the objective lens 2, and a tracking servo is performed by the lens actuator 3 which drives that objective lens 2 by the drive circuit 4.
[0015] The current beam position irradiated through an objective lens 2 is detected by the location detection means 5, and a tracking error signal is outputted from there. The tracking error signal is supplied to CPU8 through A/D converter 6 while it is fed back to the drive circuit 4 through the switch 11 which performs a control circuit 7 and tracking servo-on-off.
[0016] in CPU8, the variation rate of an objective lens 2 is detected by the displacement sensor 9 -- having -- the detected signal -- A/D converter 10 -- minding -- a lens actuator -- a variation rate -- the signal showing an amount is supplied. and the tracking error signal with which CPU8 was detected with the location detection means 5 and the lens actuator detected by the displacement sensor 9 -- a variation rate -- the timing which draws a tracking servo in stability based on an amount is detected.
[0017] If the drive of a lens actuator is performed as drawing 2 is a flow chart which shows the actuation, and it is shown in drawing 3 (b), and a tracking servo is set to OFF and it is shown in drawing 3 (c), in step 100, forward and a negative judgment will be made for a tracking error signal.
[0018] When a tracking error signal is forward, in step 101, a judgment whether a tracking error signal is negative is made. While a tracking error signal is forward, the time amount measurement shown in step 102, i.e., the time amount to which a tracking error signal continues a forward condition, is measured.
[0019] Since the tracking error signal is vibrating and becomes negative soon, a tracking error signal judges step 101 to be negative at the time. And in step 105, the division of the distance of the one half of one truck is done by measurement time amount, and a rate is found.
[0020] Next, as shown in step 106, the monitor of the amount of displacement of the lens actuator 3 at

this time is carried out, and it judges whether a tracking servo is possible in step 107. This judges whether they are the rate found at step 105, and the field where the relation of the amount of displacement calculated at step 106 can draw a tracking servo in the stability shown in drawing 10 .
[0021] In step 107, since it has detected previously return and that the polarity of a tracking error signal changed in step 101 to step 100 although a tracking error signal judges again whether it is forward when it judges that it is not the field which can draw a tracking servo in stability, it is judged to this timing that a tracking error signal is negative..
[0022] Consequently, in steps 103 and 104, time amount until the polarity of the tracking error signal mentioned above changes is measured. After that, processing shown in step 105 thru/or 107 when the tracking error signal mentioned above is forward, and same processing are performed.
[0023] If this processing is repeated whenever the polarity of a tracking error signal changes, as shown in drawing 10 , the relation between a rate and a variation rate will arrive at the field which can draw a tracking servo in stability soon. At this time, it judges that tracking servo-on is possible for step 107, and a tracking servo is set to ON as shown in step 108. That is, as shown in drawing 3 (b), a tracking servo serves as ON.
[0024] For this reason, even if residual vibration occurs, a tracking error signal serves as zero quickly, as shown in drawing 3 (a).
[0025] Next, the example when the ability not to measure the variation rate of a lens actuator is explained. In this case, the variation rate of a lens actuator does not exceed the amplitude by investigating the amplitude immediately after a head drive henceforth. That is, the amplitude is made into a variation rate, and if it is below the value (setting to drawing 10 amplitude a, then below the rate b) of the found rate, it should be able to draw in stability.
[0026] This is further explained to a detail. the lens actuator which shows drawing 4 in drawing when it is drawing explaining the reason which can detect the amplitude and a lens actuator vibrates right and left from a tracking error signal -- a variation rate arises.
[0027] a lens actuator [in / the period of vibration of this vibration is set to T, and / the period of that one half] -- the value between the cusp value-cusp values of a variation rate is twice the amplitude. The truck number of counts counted on the other hand when the signal between cusp value-cusp values has occurred with the lens actuator is the value acquired when the lens actuator moved in the range of amplitude x2.
[0028] Therefore, the distance which the lens actuator moved from the die length of the truck number of counts and one truck is known. Since the lens actuator is carrying out the variation rate of amplitude x2, the relation of "the die-length /2= amplitude of truck number-of-counts x1 truck" is drawn by migration of this lens actuator.
[0029] Drawing 5 is drawing explaining the time of detecting a rate from a tracking error signal, and the distance in which the tracking error signal carried out half period change is the one half of the distance A of one truck. Therefore, if a tracking error signal does the division of the distance of the one half of the distance A of one truck by the time amount which changes during a half period, the rate of a lens actuator can be found.
[0030] It is the time amount from which a tracking error signal changes by the half period in drawing 5 , respectively t1, t2, t3, t4, and t5 .... Then, A/2t of rates of a lens actuator is set to 1, A/2t2, A/2t3, A/2t4, and A/2t5, respectively.
[0031] Drawing 6 is the block diagram showing the configuration when the ability not to measure the variation rate of a lens actuator, and detects the timing which turns ON a tracking servo according to the flow chart shown in drawing 7 .
[0032] Immediately after a head drive, as shown in steps 150 and 151, the monitor of the tracking error signal is carried out between the one half of the period of vibration, and the number of trucks is counted. And one half of the number of trucks counted in step 152 is made into the amplitude, and this amplitude is decided as a variation rate.
[0033] Then, in step 153, time amount measurement in step 155 is performed until it detects the polarity of a tracking error signal, and a polarity will be judged at step 154 to be negative, if the polarity is

forward. Moreover, time amount measurement is performed until a polarity will sound with forward similarly in steps 158 and 159, if there is a polarity of a tracking error signal by negative.
[0034] And in step 156, by doing the division of the distance of the one half of one truck by measurement time amount, a rate is found and it judges whether it is possible to turn ON a tracking servo in step 157.
[0035] Here, if it is judged that it is not the timing in which a tracking servo is still possible, it will judge whether it is possible to set a tracking servo to ON in step 157, whenever the polarity of return and a tracking error signal changes to step 153.
[0036] Since the timing which can turn ON a tracking servo is soon detected in step 157, a tracking servo is set to ON in step 160.
[0037]
[Effect of the Invention] In the optical information processor according to this invention as explained above Detect the amplitude of residual vibration from the amount of displacement or tracking error signal of the direction of tracking of a lens actuator, and the field which can draw a tracking servo in stability from the value and rate of an actuator is detected. Since it was made to set the tracking servo made off to ON, it has in stability the effectiveness that a high speed can moreover be accessed now, without being able to resume a tracking servo and oscillating, without waiting for convergence of residual vibration.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the 1st example of this invention.
[Drawing 2] It is the flow chart which shows actuation of the equipment of drawing 1 .
[Drawing 3] It is drawing showing the relation between the head drive condition of equipment, and a tracking error signal which applied this invention.
[Drawing 4] It is drawing for explaining why the amplitude of a lens actuator is called for from a tracking error signal.
[Drawing 5] It is drawing for explaining the reason for the ability finding a rate from a tracking error signal.
[Drawing 6] It is the block diagram showing the configuration of the 2nd example of this invention.
[Drawing 7] It is the flow chart which shows actuation of the equipment of drawing 6 .
[Drawing 8] It is drawing for explaining a tracking servo.
[Drawing 9] It is drawing showing the relation between the head drive condition in conventional equipment, and a tracking error signal.
[Drawing 10] A tracking servo is drawing showing the field which can be drawn in stability.
[Description of Notations]
1 Record Medium
2 Objective Lens
3 Lens Actuator
4 Drive Circuit
5 Location Detection Means
6 Ten A/D converter
7 Control Circuit
8 CPU
9 Displacement Sensor
11 Switch

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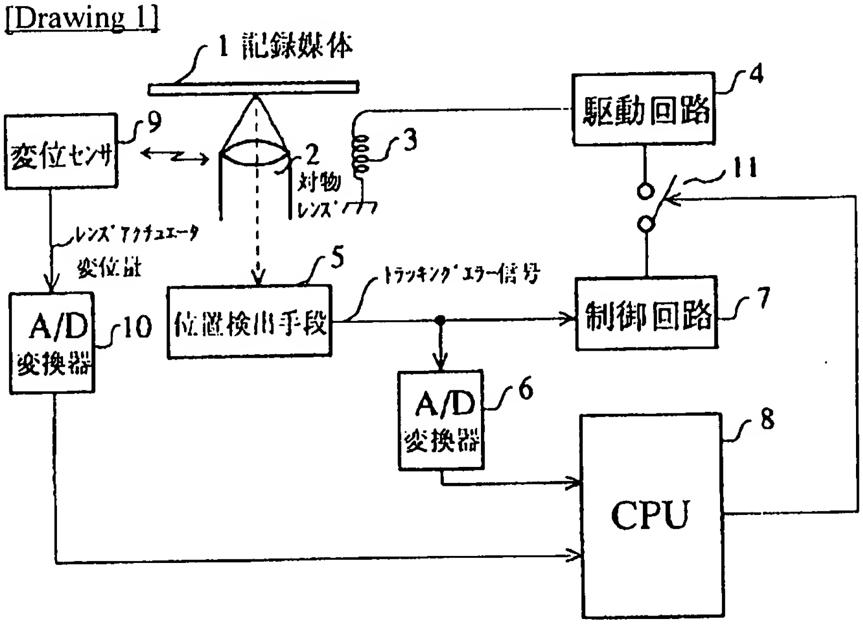
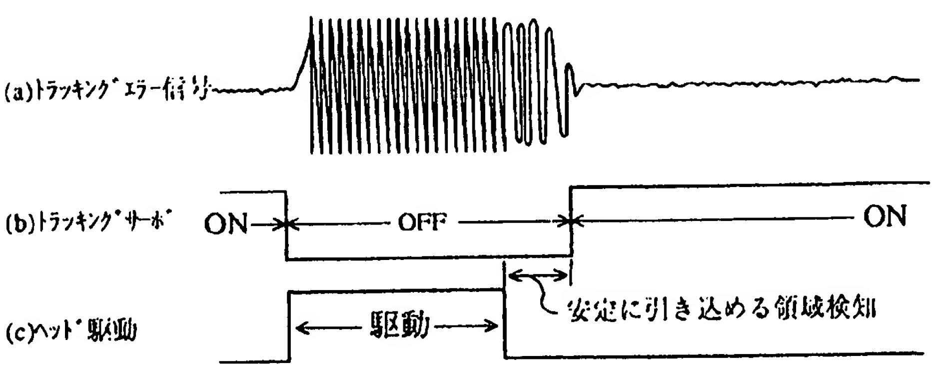
DRAWINGS

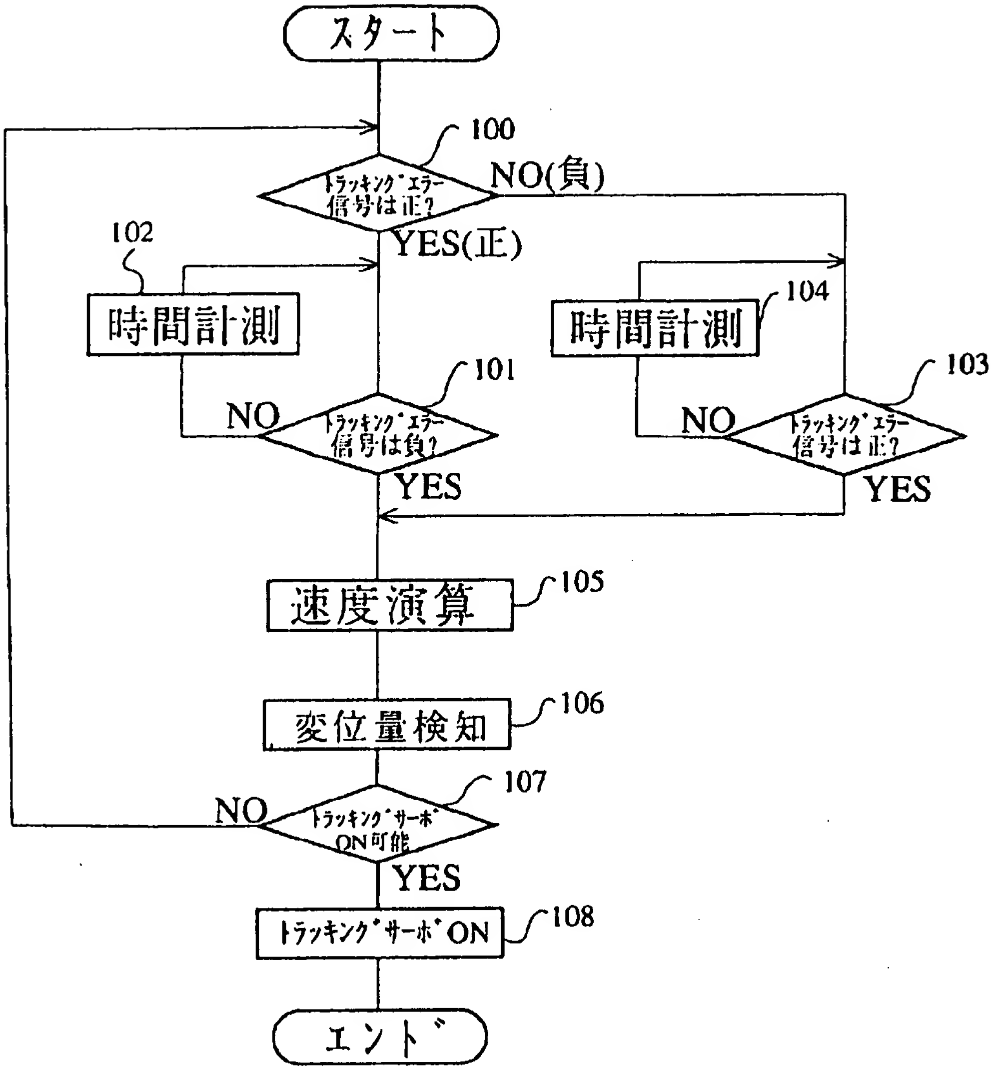
[Drawing 1]



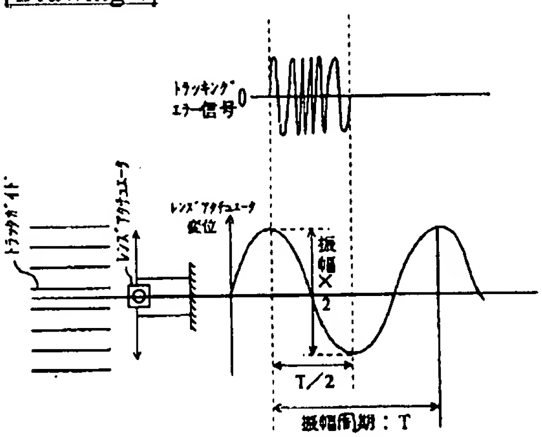
[Drawing 3]



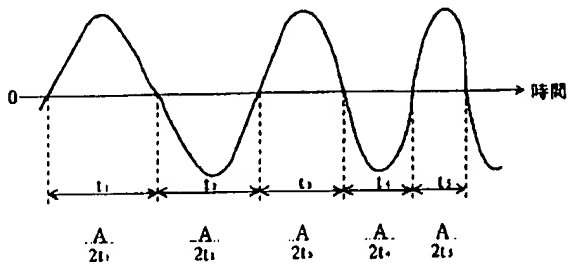
[Drawing 2]



[Drawing 4]



[Drawing 5]



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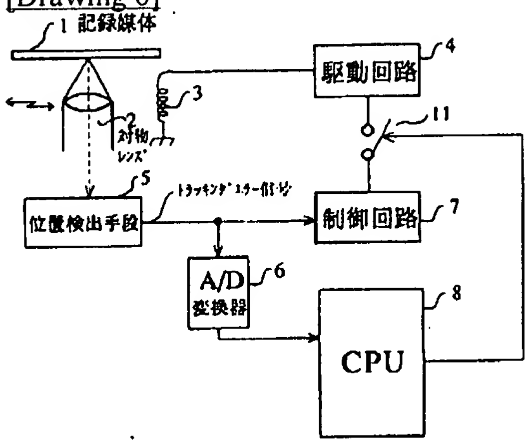

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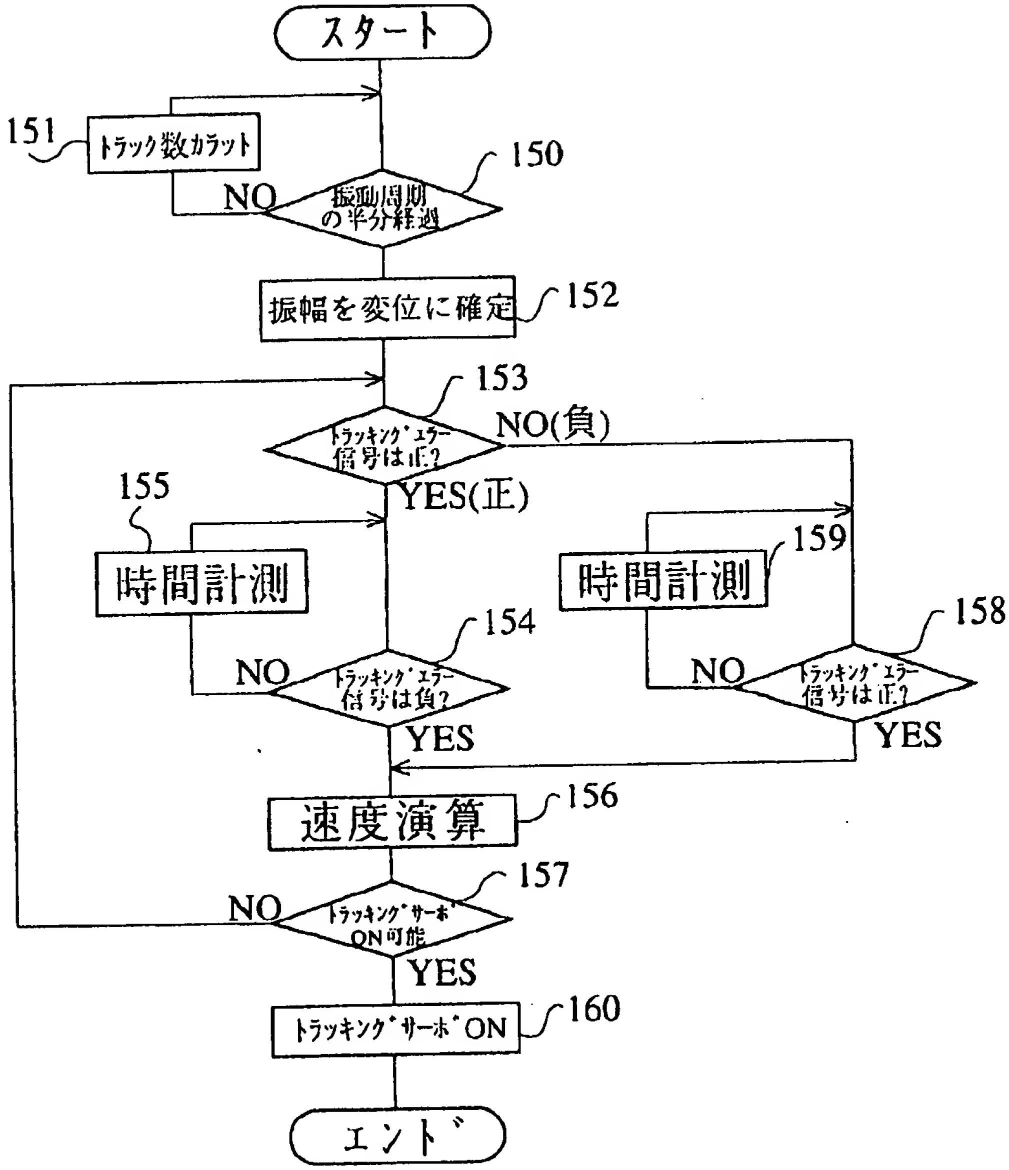
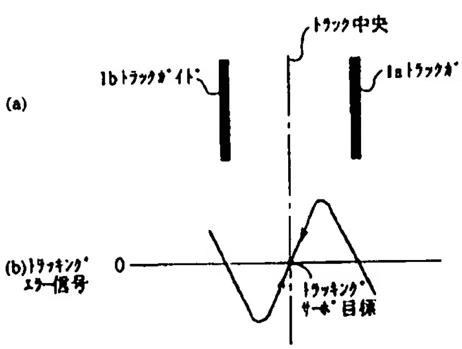
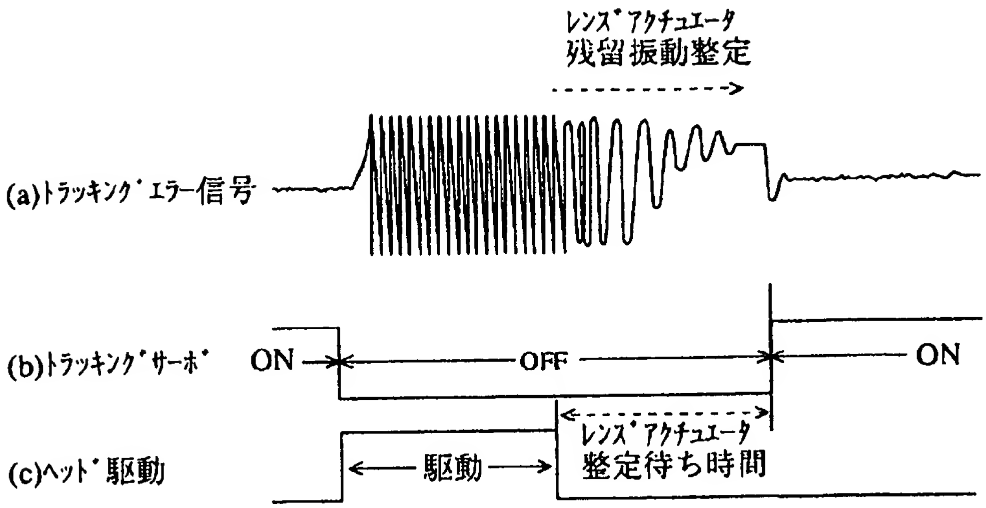


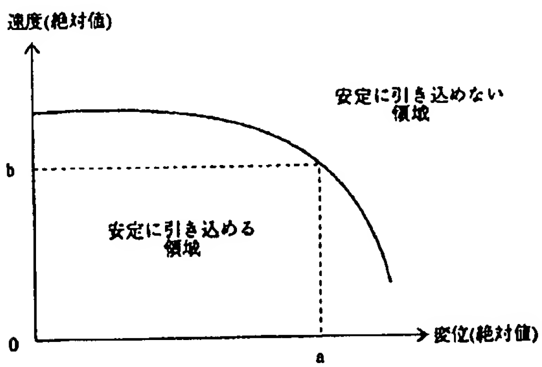
[Drawing 8]



[Drawing 9]



[Drawing 10]



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